REPAIR, EVALUATION, MAINTENANCE, AND REHABILITATION RESEARCH PROGRAM

TECHNICAL REPORT REMR-HY-6

INVENTORY OF RIVER TRAINING STRUCTURES IN SHALLOW-DRAFT WATERWAYS

by

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October 1989
Final Report

Prepared for DEPARTMENT OF THE ARMY
US Army Corps of Engineers
Washington, DC 20314-1000

Under Civil Works Research Work Unit 32324

The following two letters used as part of the number designating technical reports of research published under the Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Research Program identify the problem area under which the report was prepared:

	Problem Area		Problem Area
CS	Concrete and Steel Structures	EM	Electrical and Mechanical
GT	Geotechnical	EI	Environmental Impacts
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COVER PHOTOS:

TOP — Dike damage on the Arkansas River, US Army Engineer District, Tulsa.

BOTTOM — Dike No. 333.3(L) being repaired, Arkansas River, US Army Engineer District, Little Rock.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a REPORT SECURITY CLASSIFICATION Unclassified	1b RESTRICTIVE MARKINGS
2a SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b DECLASSIFICATION/DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S) Technical Report REMR-HY-6	5 MONITORING ORGANIZATION REPORT NUMBER(S)
6a NAME OF PERFORMING ORGANIZATION USAEWES Hydraulics Laboratory 6b OFFICE SYMBOL (If applicable) CEWES-HR-P	7a NAME OF MONITORING ORGANIZATION
6c ADDRESS (City, State, and ZIP Code) PO Box 631 Vicksburg, MS 39181-0631	7b ADDRESS (City, State, and ZIP Code)
8a NAME OF FUNDING/SPONSORING ORGANIZATION US Army Corps of Engineers 8b OFFICE SYMBOL (If applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c ADDRESS (City, State, and ZIP Code) Washington, DC 20314-1000	10 SOURCE OF FUNDING NUMBERS See reverse PROGRAM ELEMENT NO / PROJECT NO / TASK NO / WORK UNIT ACCESSION NO

11 TITLE (Include Security Classification)
Inventory of River Training Structures in Shallow-Draft Waterways

12 PERSONAL AUTHOR(S)
Derrick, David L.; Gernand, Herbert W.; and Crutchfield, James P.

13a TYPE OF REPORT	13b TIME COVERED	14 DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
Final report	FROM _____ TO _____	October 1989	35

16 SUPPLEMENTARY NOTATION A report of the Hydraulics Problem Area of the Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Research Program. Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

17 COSATI CODES		
FIELD	GROUP	SUB-GROUP

18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
Dikes (training structures) Riverine
Inventory River training structures
Maintenance

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

The repair of deep- and shallow-draft training structures has continued to be a significant maintenance cost for structures maintained by the US Army Corps of Engineers. This maintenance includes the repair of dikes and revetments damaged as a result of ice, floating debris, impact from navigation, or undermining due to flow conditions. There is no guidance generally available to evaluate these damaged structures and to determine when rehabilitation or repair is more cost-effective than replacement of the structure.

The objective of this work unit of the Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Research Program is to inventory training structures, document past dike repair work, facilitate technology transfer among Corps Districts through reports and workshops, document current repair methods, and write specific guidelines for structure

(Continued)

20 DISTRIBUTION/AVAILABILITY OF ABSTRACT	21 ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	Unclassified
22a NAME OF RESPONSIBLE INDIVIDUAL	22b TELEPHONE (Include Area Code) / 22c OFFICE SYMBOL

DD Form 1473, JUN 86 Previous editions are obsolete SECURITY CLASSIFICATION OF THIS PAGE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

10. WORK UNIT ACCESSION NO. (Continued).

Funding provided by Repair, Evaluation, Maintenance, and Rehabilitation Research Program Work Unit No. 32324, sponsored by the Headquarters, US Army Corps of Engineers.

19. ABSTRACT (Continued).

inspection, evaluation, and repair. In support of this objective, this report locates, identifies, and describes existing Corps-built and -maintained training structures in shallow-draft nontidal-influenced waterways.

This report includes a glossary of training structure terms and lists by District all river training structures currently maintained and used by the Corps throughout the continental United States by District, river, river mile where located, and type of dike.

Preface

An inventory of river training structures built and maintained by the US Army Corps of Engineers was compiled during the period September 1986-August 1988 by the Estuaries and Waterways Divisions, Hydraulics Laboratory, US Army Engineer Waterways Experiment Station (WES) for the Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Research Program, sponsored by the Headquarters, US Army Corps of Engineers (USACE), under Work Unit 32324, "Repair Techniques at Navigation Training Structures."

This inventory was compiled by Messrs. D. L. Derrick, J. P. Crutchfield, C. K. Green, and R. R. Henderson, Potamology Branch; R. A. McCollum, River Regulation Branch, Waterways Division; and Dr. Herbert W. Gernand, North Dakota State University, Fargo, ND, assigned to the Estuarine Engineering Branch, Estuaries Division, under the Intergovernmental Personnel Act. The work was conducted under the general supervision of Messrs. F. A. Herrmann, Jr., Chief of the Hydraulics Laboratory; R. A. Sager, Assistant Chief of the Hydraulics Laboratory; W. H. McAnally, Jr., Chief of the Estuaries Division; M. B. Boyd, Chief of the Waterways Division; W. D. Martin, Chief of the Estuarine Engineering Branch, Estuaries Division; C. R. Nickles, Acting Chief of the Potamology Branch, Waterways Division; and F. F. Athow, Estuarine Engineering Branch, Principal Investigator.

The REMR Directorate of Research and Development Coordinator in USACE was Mr. Jesse A. Pfeiffer, Jr., and members of the REMR Overview Committee, USACE, were Mr. James E. Crews, Chairman, and Dr. Tony C. Liu. The REMR Technical Monitor for Hydraulics was Mr. Glenn Drummond, USACE. The REMR Program Manager was Mr. William F. McCleese, Structures Laboratory, WES, and the Problem Area Leader was Mr. Glenn A. Pickering, Hydraulic Structures Division, Hydraulics Laboratory. This report was written by Messrs. Derrick and Crutchfield and Dr. Gernand and edited by Mrs. M. C. Gay, Information Technology Laboratory, WES.

Acting Commander and Director of WES during preparation of this report was LTC Jack R. Stephens, EN. Technical Director was Dr. Robert W. Whalin.

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INVENTORY OF RIVER TRAINING STRUCTURES IN SHALLOW-DRAFT WATERWAYS

Background

1. The US Army Corps of Engineers has established the Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Research Program to develop new and improved technology for extending the life of the United States' water resource projects. The repair of deep- and shallow-draft training structures has continued to be a significant maintenance cost within the Corps. This maintenance has included the repair of dikes and revetments damaged as a result of ice, floating debris, impact from navigation, or undermining due to flow conditions. There is no guidance generally available to evaluate these damaged structures and to determine when rehabilitation or repair is more cost-effective than replacement of the structure.

Objective

2. The objective of this work unit is to inventory dike training structures, document past dike repair work, facilitate technology transfer between Corps Districts through reports and workshops, document current repair methods, and write specific guidelines for structure inspection, evaluation, and repair. The objective of this report is to locate, identify, and describe existing Corps-built and -maintained dikes in shallow-draft nontidal-influenced waterways. Pankow and Trawle (1988)* list structures found in estuarine and deep-draft navigable waterways.

Approach

3. A survey of the latest Project Maps of all Corps Districts in the continental United States of America was undertaken. This information was supplemented and confirmed by contacting river engineers working in the

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* Walter Pankow and Michael J. Trawle. 1988 (Aug). "Inventory of Training Structures in Estuaries," Technical Report HL-88-20, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Districts. All information presented is current through calendar year 1987. Dikes are listed in tabular form according to District, river, river mile where located, and type of dike.

Organization of Report

4. A glossary of terms is included in this report. Figure 1 shows the top and profile views of a typical pile dike. Figures 2 and 3 show the section and profile views of typical stone and stone-filled pile dikes, respectively. Table 1 lists in alphabetical order all Districts that do not have any dikes. Tables 2 through 13 list by District all river training structures currently maintained and used by the Corps throughout the continental United States. Table 14 lists the number of dikes each District maintains and the total number of dikes the Corps maintains nationwide.

Glossary

5. Definitions and usage of some terms varied from District to District. In order to eliminate any confusion, a list of terms with definitions is included for the reader's convenience. The purpose and uses of each dike type are also explained. A list of references follows the definitions.

CLOSURE STRUCTURE - (a) An earthen dam built on the downstream face of a closure dike. Built of uncompacted fill below the waterline and semicompacted fill above. Taller than the closure dike, it is used to prevent silting in the cutoff portion of the river. Built for environmental purposes. Also called a closure dam. This definition is used primarily by the Vicksburg District. (b) An earth- or stone-fill dam of near top bank height, connecting the mainland with an island in the river, creating a slack-water lake below it. This definition is used primarily by the Memphis District.

CLUMP - A group of piles bound together by steel cable. Usually three piles are used to form a clump. Also called piling or dolphin.

CONTROL WEIR - A dam in a stream or river used to raise or control the upstream water level.

CUTOFF - A channel cut across the neck of a bend. The closure of a bend, either by natural meandering of the river or man-made.

CUTOFF DIKE - (a) Structure built from bank to bank used to close off the river channel and guide the river into a cutoff pilot channel. (b) Structure used to close secondary channels and guide the water into the main channel. Also called a closure dike.

DEEP DRAFT - A navigation channel with a continuous depth greater than 15 ft (4.6 m).

DIKE - A structure extending outward from the bank toward the channel normal to or at an angle to the flow of the river. The purpose is to redirect or confine the main streamflow to increase navigation depth and/or prevent bank scour. Other names used: groin, cross dike, spur dike, spur dam, cross dam, wing dam, spur, and jetty.

PILE - A long, heavy timber or section of concrete or metal driven or jetted into the bank or riverbed. Timber piles are usually treated to resist rotting.

PILE DIKE - A permeable structure built of from one to five rows of piles or clumps usually angled normal to riverflow. Designed to reduce the water velocity as streamflow passes through the dike so that sediment deposition occurs, mostly downstream of the dike. This causes the main channel to carry a larger proportion of water, thereby increasing currents and sediment transport capacity. As a result, a more efficient section and greater depth are maintained in the main channel.

SHALLOW DRAFT - A navigation channel with a continuous depth of 15 ft or less (4.6 m). In the context of this report, shallow draft further designates a navigation channel not influenced by tidal action.

SILL - An underwater dike normal to flow, sometimes stretching the width of the channel, designed to decrease channel depth and increase channel width.

STONE DIKE - An impermeable structure of either quarry-run or Graded Stone A usually built normal to riverflow. Designed to direct flow away from the banks to increase navigation depths or to prevent bank erosion.

STONE-FILLED PILE DIKE - (a) A damaged or deteriorated pile dike that has been repaired by dumping stone along its length to a specified elevation, usually midbank height. (b) A dike built in stages for reasons of economy. The piles are driven, the river deposits fill around the piles, and stone is dumped on top of the river fill. The piling enables the stone to stand on a steeper slope than the natural angle of repose for additional savings.

Glossary References

Fenwick, G. B., ed. 1969 (Oct). "State of Knowledge of Channel Stabilization in Major Alluvial Rivers," Technical Report No. 7, prepared for US Army Corps of Engineers Committee on Channel Stabilization by US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Morris, Henry M., and Wiggert, James M. 1972. Applied Hydraulics in Engineering, 2nd ed., Ronald Press, New York.

Pankow, Walter E., and Athow, Robert F., Jr. 1986 (Jul). "Annotated Bibliography for Navigation Training Structures," Technical Report REMR-HY-1, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Pokrefke, Thomas J., Jr. 1977 (Dec). "Design of Stone Spur Dikes," unpublished paper for Mississippi State University, Mississippi State, MS, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Summary

6. This inventory of shallow-draft training structures was generated by a literature search of Project Maps of all Corps Districts within the continental United States. This information provides the foundation for a data base of these structures.

7. At this time it is known that there are 10,652 training structures located in shallow-draft, nontidal-influenced riverine areas. These structures are categorized as follows:

a. 6,132 stone dikes

b. 2,979 stone-filled pile dikes

c. 1,503 pile dikes

d. 35 closure structures

e. 2 sills

f. 1 control weir

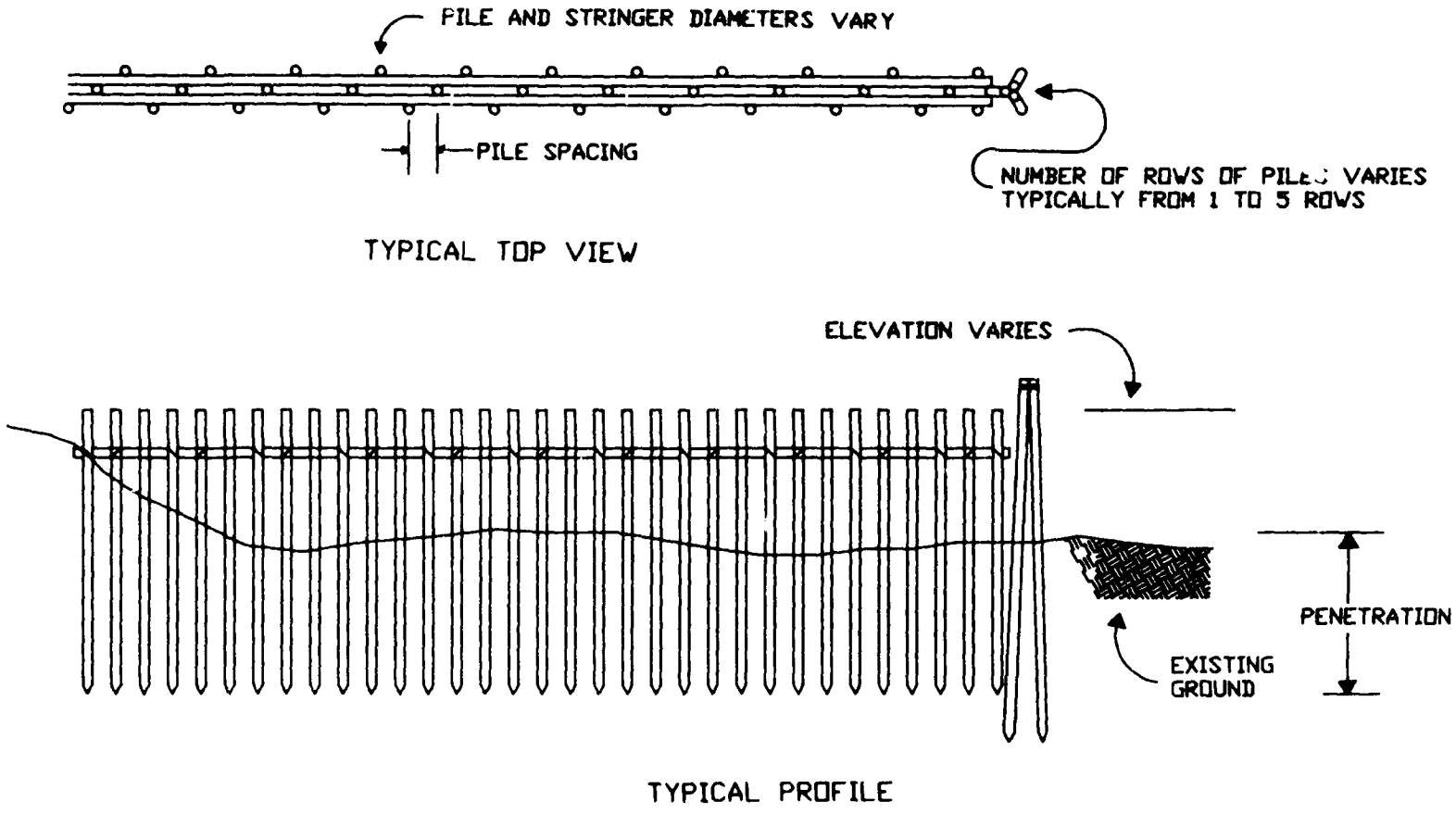

Figure 1. Typical pile dike

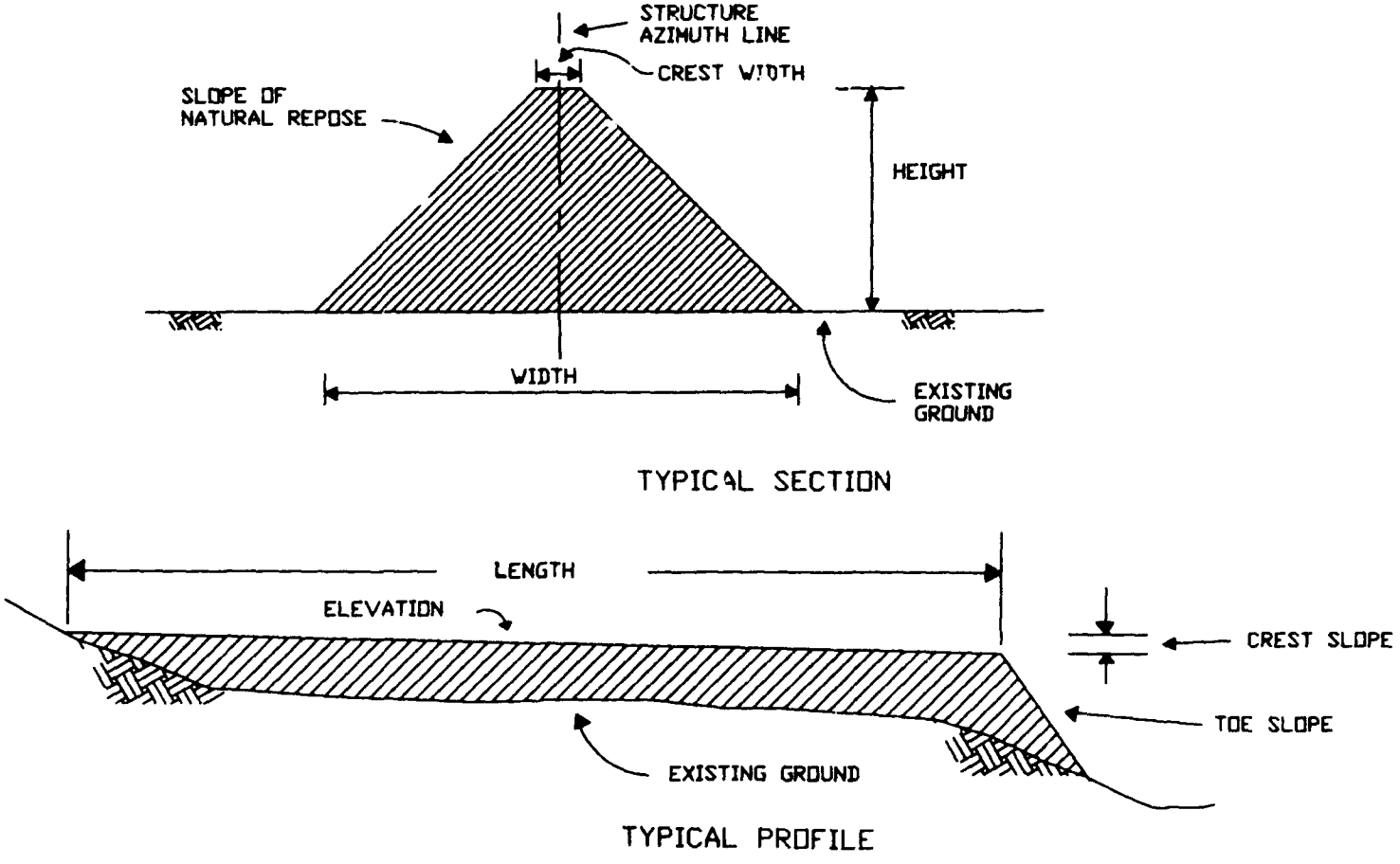

Figure 2. Typical stone dike

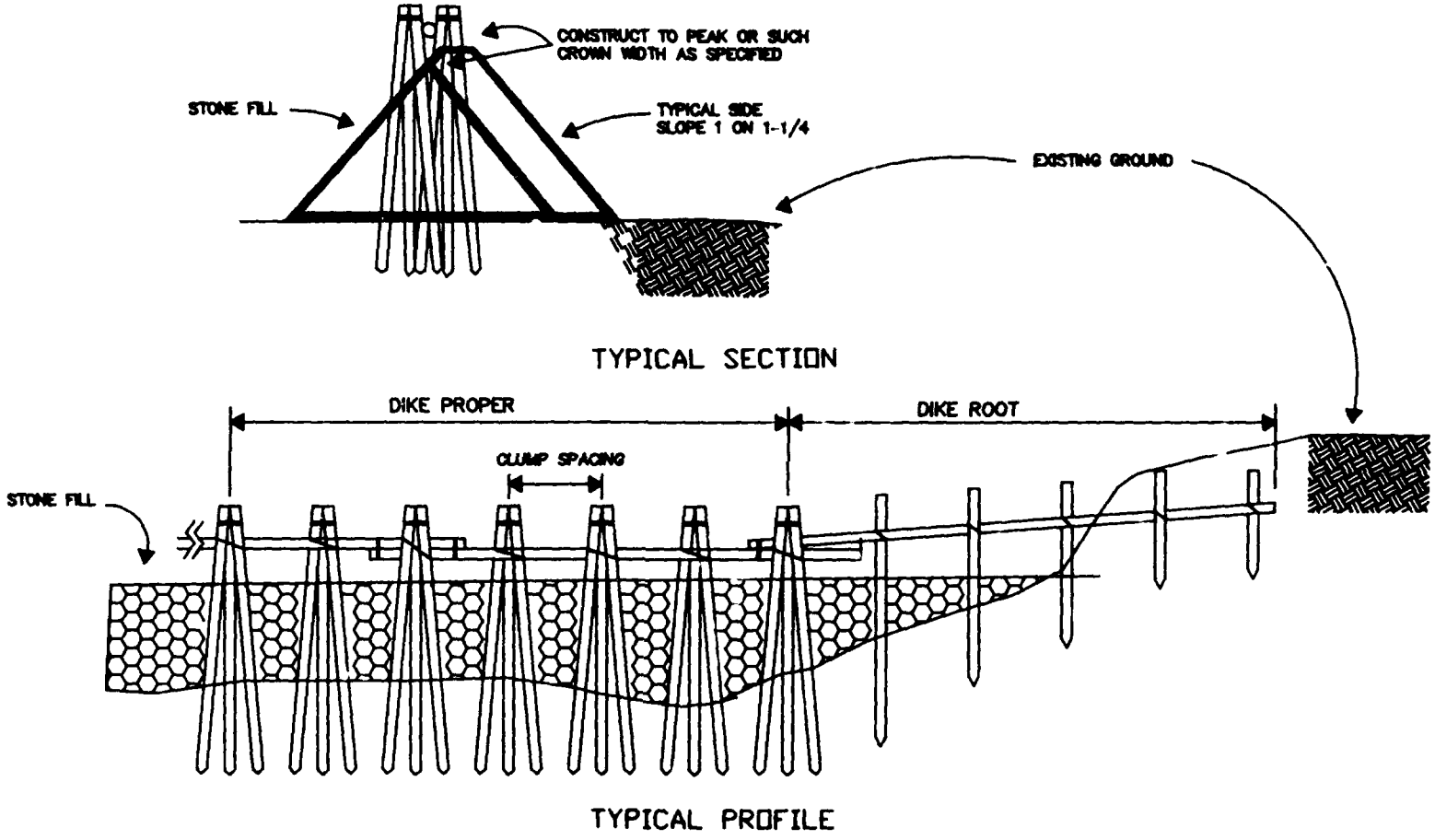

Figure 3. Typical stone-filled pile dike

Table 1

Districts Without Dikes

Project maps of the following Districts were examined, and no river training structures were found.

1. Alaska District
2. Albuquerque District
3. Baltimore District
4. Buffalo District
5. Charleston District
6. Chicago District
7. Detroit District
8. Fort Worth District
9. Galveston District
10. Huntington District
11. Jacksonville District
12. Los Angeles District
13. Louisville District
14. Nashville District
15. New England Division
16. New Orleans District
17. New York District
18. Norfolk District
19. Philadelphia District
20. Pittsburgh District
21. Sacramento District
22. San Francisco District
23. Seattle District
24. Walla Walla District
25. Wilmington District

Note: Table 14 lists Districts with dikes. The number of dikes in each District and the total number of dikes within the Corps are also listed.

Table 2

Kansas City District, Missouri River Division

Based on 1985 Project Maps

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Missouri River, Rulo, NE, to mouth, Maps 1-8	498 to 490	10	10	27
	490 to 480	27	7	31
	480 to 470	35	3	33
	470 to 460	34	7	58
	460 to 450	24	10	41
	450 to 440	29	6	37
	440 to 430	22	9	42
	430 to 420	25	11	35
	420 to 410	27	15	31
	410 to 400	33	7	44
Missouri River Maps 8-16	400 to 390	35	9	27
	390 to 380	24	8	39
	380 to 370	17	8	19
	370 to 360	28	9	22
	360 to 350	16	13	38
	350 to 340	20	11	52
	340 to 330	35	21	30
	330 to 320	17	20	35
	320 to 310	17	26	32
	310 to 300	20	13	34
Missouri River Maps 16-22	300 to 290	29	13	26
	290 to 280	16	17	30
	280 to 270	24	19	24
	270 to 260	23	16	48
	260 to 250	31	10	34
	250 to 240	27	16	22
	240 to 230	26	16	28
	230 to 220	21	10	43
	220 to 210	42	3	17
	210 to 200	40	10	21
Missouri River Maps 22-31	200 to 190	31	15	30
	190 to 180	24	16	39
	180 to 170	30	15	28
	170 to 160	28	3	18
	160 to 150	20	7	39
	150 to 140	40	11	30
	140 to 130	23	28	35
	130 to 120	24	16	26
	120 to 110	33	6	23
	110 to 100	29	13	32

(Continued)

Table 2 (Concluded)

Kansas City District

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Missouri River Maps 31-40	100 to 90	39	10	20
	90 to 80	41	5	27
	80 to 70	23	18	33
	70 to 60	15	15	39
	60 to 50	16	9	27
	50 to 40	23	10	41
	40 to 30	31	18	28
	30 to 20	30	7	34
	20 to 10	34	13	35
	10 to 0	23	12	45
Totals		1,331	600	1,629

Total, Kansas City District: 3,560 dikes

Table 3

Little Rock District, Southwestern Division

Based on 1986 Project Maps

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Arkansas River, AR	310 to 305	26	0	0
Map A-26	305 to 300	31	1	0
	300 to 295	12	0	0
	295 to 289	36	0	0
Arkansas River, AR	289 to 285	20	0	0
Map A-27	285 to 280	17	1	0
	280 to 275	16	0	0
Arkansas River, AR	275 to 256	5	0	0
Maps A-27 and A-28	256 to 250	25	0	0
	250 to 245	20	0	0
	245 to 239	19	0	0
Arkansas River, AR	239 to 235	9	0	0
Map A-28.1				
Arkansas River, AR	205 to 200	16	0	4
Map A-29	200 to 195	11	0	6
	195 to 189	27	0	2
Arkansas River, AR	189 to 185	13	0	0
Maps A-30 and A-31	185 to 180	7	0	0
	180 to 175	26	0	0
	175 to 170	26	0	1
Arkansas River, AR	170 to 165	12	0	1
Map A-31	165 to 160	17	0	1
	160 to 155	33	0	1
Arkansas River, AR	155 to 150	31	0	1
Map A-32	150 to 145	16	0	12
	145 to 140	14	0	0
	140 to 135	14	0	7
Arkansas River, AR	135 to 130	9	0	6
Map A-33	130 to 125	20	0	11
	125 to 120	16	0	16
Arkansas River, AR	120 to 115	17	0	0
Map A-34	115 to 110	12	0	14
	110 to 105	14	0	8
	105 to 100	32	0	7

(Continued)

Table 3 (Concluded)

Little Rock District

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Arkansas River, AR	100 to 95	5	0	3
Map A-35	95 to 90	12	0	2
	90 to 85	11	0	2
Arkansas River, AR	85 to 80	21	0	7
Map A-36	80 to 75	5	0	6
Arkansas River, AR	75 to 70	6	1	9
Map A-37	70 to 65	7	0	6
	65 to 60	22	9	0
Arkansas River, AR	60 to 55	4	1	7
Maps A-38 and A-39	55 to 50	3	4	14
	50 to 45	7	0	22
Arkansas River, AR	45 to 40	13	5	4
Map A-39	40 to 35	16	0	15
	35 to 30	12	0	7
Arkansas River, AR	30 to 25	11	0	7
Map A-40	25 to 20	7	0	6
	Totals	781	22	215

Total, Little Rock District: 1,018 dikes

Table 4

Memphis District, Lower Mississippi Valley Division

Based on 1985 Project Maps, and River Stabilization

Records Complete Through 1987

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Mississippi River,	950 to 940	11	2	1
TN, MS, AR	940 to 910	4	0	0
Map 1-11.1-1	910 to 900	8	0	0
	900 to 890	3	0	0
	890 to 880	5	0	2
	880 to 870	6	5	3
	870 to 860	3	0	0
	860 to 850	10	0	6
	850 to 840	12	0	0
	840 to 830	3	2	9
	830 to 820	3	0	5
	820 to 810	3	0	0
	810 to 800	7	0	0
	800 to 790	12	0	0
	790 to 780	3	0	0
	780 to 770	0	3	1
	770 to 760	1	0	1
	760 to 755	4	0	2
Mississippi River,	755 to 750	3	0	0
TN, MS, AR	750 to 740	11	6	8
Map 1-11.1-2	740 to 730	5	1	1
	730 to 720	7	3	4
	720 to 710	3	5	1
	710 to 700	11	1	4
	700 to 690	5	0	1
	690 to 680	2	0	0
	680 to 670	4	0	0
	670 to 660	7	0	2
	660 to 650	2	1	4
	650 to 640	3	0	0
	640 to 630	5	2	7
	630 to 620	7	0	0
	620 to 610	4	0	0
	610 to 600	3	0	0
Totals		180	31	62

Total, Memphis District: 273 dikes

Note: One hundred and five stone dikes are scheduled to be built between 1988 and 2010 to complete the Master Plan for the Mississippi River within the Memphis District. Three to five dikes will be built per year.

Table 5

Mobile District, South Atlantic Division

Data Supplied by District Project Engineers

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Alabama River, AL	66.8 to 57	12	0	0
	49.5 to 43	17	0	0
	23.3 to 22	9	0	0
	9.0	1	0	0
Apalachicola River, FL	102.7 to 90.2	29	7	9
	90.0 to 82.9	19	7	3
	79.4	0	1	0
	79.3 to 79.0	9	0	0
	65.5 to 47.4	1	4	2
	32.9	5	0	0
	20.7 to 7.5	18	0	0
Totals		120	19	14

Total, Mobile District: 153 dikes

Note: Eleven existing dikes are scheduled to be removed and thirty dikes scheduled to be built in the Alabama River from miles 67.5 to 8.0. Construction will begin in 1989 and end in 1990.

Table 6

Omaha District, Missouri River Division

Based on 1982 Project Maps

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Missouri River,	753 to 750	18	0	3
Kenslers Bend, NE,	750 to 745	37	0	9
to Sioux City, IA	745 to 740	18	6	10
Map 49 (Part II)	740 to 734	28	10	8
Missouri River,	734 to 730	10	27	26
Sioux City, IA,	730 to 725	14	20	27
to Rulo, NE	725 to 720	25	8	7
Maps 1-3 (Part I)	720 to 715	17	3	12
Missouri River,	715 to 710	32	5	0
Sioux City, IA,	710 to 705	34	7	9
to Rulo, NE	705 to 700	29	7	23
Maps 3-5 (Part I)	700 to 695	6	7	32
Missouri River,	695 to 690	33	7	12
Sioux City, IA,	690 to 685	32	17	7
to Rulo, NE	685 to 680	29	8	10
Maps 5-7 (Part I)	680 to 675	30	8	16
Missouri River,	675 to 670	31	3	27
Sioux City, IA,	670 to 665	35	3	16
to Rulo, NE	665 to 660	29	16	5
Maps 7-9 (Part I)	660 to 655	23	12	28
Missouri River,	655 to 650	31	7	13
Sioux City, IA,	650 to 645	28	13	16
to Rulo, NE	645 to 640	17	37	6
Maps 9-12 (Part I)	640 to 635	18	7	23
Missouri River,	635 to 630	25	9	21
Sioux City, IA,	630 to 625	33	9	12
to Rulo, NE	625 to 620	29	8	18
Maps 12-14 (Part I)	620 to 615	25	5	16
Missouri River,	615 to 610	19	10	19
Sioux City, IA,	610 to 605	36	14	17
to Rulo, NE	605 to 600	15	7	26
Maps 14-15 (Part I)	600 to 595	46	16	17
Missouri River,	595 to 590	34	6	17
Sioux City, IA,	590 to 585	26	8	25
to Rulo, NE	585 to 580	28	10	27
Maps 15-18 (Part I)	580 to 575	30	10	23

(Continued)

Table 6 (Concluded)

Omaha District

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Missouri River,	575 to 570	37	9	23
Sioux City, IA,	570 to 565	15	4	28
to Rulo, NE	565 to 560	19	7	41
Maps 18-20 (Part I)	560 to 555	22	5	37
Missouri River,	555 to 550	21	8	32
Sioux City, IA,	550 to 545	29	12	16
to Rulo, NE	545 to 540	20	21	22
Maps 20-23 (Part I)	540 to 535	24	4	33
Missouri River,	535 to 530	31	3	28
Sioux City, IA,	530 to 525	32	9	29
to Rulo, NE	525 to 520	31	20	24
Maps 23-27 (Part I)	520 to 498	123	37	91
Missouri River, Aten, NE, to Yankton, SD Map 70 (Part II)	899 to 897	0	3	0
Totals		1,354	492	987

Total, Omaha District: 2,833 dikes

Table 7

Portland District, North Pacific Division

Based on 1985 Project Maps

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Cowlitz River, WA Map 18	0	3	0	0

Total, Portland District: 3 dikes

Table 8

Rock Island District, North Central Division

Based on 1985 Project Maps

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Mississippi River,	615 to 610	23	0	0
IA-WI	610 to 600	41	0	0
Map 3	600 to 590	45	0	0
	590 to 580	25	0	0
Mississippi River,	580 to 570	37	0	0
IA-IL	570 to 560	26	0	0
Map 4	560 to 556.7	13	0	0
Mississippi River,	556.7 to 550	27	0	0
IA-IL	550 to 540	38	0	0
Map 5	540 to 530	34	0	0
	530 to 522.5	28	0	0
Mississippi River,	522.5 to 520	12	0	0
IA-IL	520 to 510	33	0	0
Map 6	510 to 500	39	0	0
	500 to 493	1	0	0
Mississippi River,	493 to 490	0	0	0
IA-IL	490 to 482.9	0	0	0
Map 7				
Mississippi River,	482.9 to 480	5	0	0
IA-IL	480 to 470	61	0	0
Map 8	470 to 460	49	0	0
	460 to 457.2	6	0	0
Mississippi River,	457.2 to 450	23	0	0
IA-IL	450 to 440	35	0	0
Map 9	440 to 437	11	0	0
Mississippi River,	437 to 430	31	0	0
IA-IL	430 to 420	42	0	0
Map 10	420 to 410.5	36	0	0
Mississippi River,	410.5 to 400	8	0	0
IA-IL	400 to 365	0	0	0
Map 11				
Mississippi River	365 to 360	13	0	0
IA-IL-MO	360 to 350	27	0	0
Map 12	350 to 343.2	27	0	0

(Continued)

Table 8 (Concluded)

Rock Island District

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Mississippi River	343.2 to 340	7	0	0
IA-IL	340 to 330	37	0	0
Map 13	330 to 325	20	0	0
Mississippi River	325 to 320	26	0	0
MO-IL	320 to 310	36	0	0
Map 14	310 to 301.2	26	0	0
Mississippi River,	301.2 to 290	34	0	0
MO-IL	290 to 280	19	0	0
Map 15	280 to 273.5	10	0	0
Mississippi River,	273.5 to 270	9	0	0
MO-IL	270 to 260	28	0	0
Map 16				
Totals		1,048	0	0

Total, Rock Island District: 1,048 dikes

Table 9

Savannah District, South Atlantic Division

Based on 1984 Navigation Charts

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Savannah River, SC-GA				
Sheets 8, 9	190 to 180	0	41	0
Sheets 10, 11	180 to 170	0	5	0
Sheets 13, 14	170 to 160	0	17	0
Sheets 15, 16, 17	160 to 150	0	14	0
Sheets 18, 19, 20	150 to 140	0	43	0
Sheets 21, 22, 23	140 to 130	0	18	0
Sheets 23, 24, 25	130 to 120	0	19	0
Sheets 26, 27	120 to 110	0	12	0
Sheet 28	110 to 100	0	3	0
Sheet 31	100 to 90	0	5	0
Sheet 32	90 to 80	0	3	0
Sheets 34, 35	80 to 70	0	23	0
Sheets 37, 38	70 to 60	0	17	0
Sheets 40, 41	60 to 50	0	27	0
Sheet 44	50 to 40	0	3	0
Sheet 45	40 to 30	0	1	0
Sheet 48	30 to 20	0	2	0
Totals		0	253	0

Total, Savannah District: 253 dikes

Table 10

St. Louis District, Lower Mississippi Valley Division

Based on 1985 Project Maps

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Mississippi River, IL-MO Lock and Dam No. 24 Area Map 1-21.1	300 to 274	5	0	0
Mississippi River, IL-MO Lock and Dam No. 25 Area Map 1-17.4	274 to 241	10	0	0
Mississippi River, IL-MO Lock and Dam No. 26 Area	241 to 203	10	0	0
Mississippi River, IL-MO Map 1-14	203 to 195	16	0	0
	195 to 190	11	0	0
	190 to 184	14	0	0
Mississippi River, IL-MO Map 1-12	184 to 180	8	0	0
	180 to 175	13	0	0
	175 to 170	2	0	0
	170 to 167	14	0	0
Mississippi River, IL-MO Map 1-11	167 to 160	39	0	0
	160 to 155	22	0	0
	155 to 150.2	34	0	0
Mississippi River, IL-MO Map 1-10	150.2 to 145	34	0	0
	145 to 140	39	0	0
	140 to 135.3	17	0	0
Mississippi River, IL-MO Map 1-9	135.3 to 130	28	0	0
	130 to 125	13	0	0
	125 to 121.7	37	0	0
Mississippi River, IL-MO Map 1-8	121.7 to 120	4	0	0
	120 to 11.	21	0	0
	115 to 110	29	0	0
	110 to 107.5	8	0	0
Mississippi River, IL-MO Map 1-7	107.5 to 105	15	0	0
	105 to 100	35	0	0
	100 to 95	18	0	0
	95 to 90	14	0	0

(Continued)

Table 10 (Concluded)

St. Louis District

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Mississippi River, IL-MO	90 to 85	24	0	0
Map 1-6	85 to 80	2	0	0
Mississippi River, IL-MO	80 to 75	16	0	0
Map 1-5	75 to 70	28	0	0
	70 to 65	27	0	0
	65 to 63.7	6	0	0
Mississippi River, IL-MO	63.7 to 60	32	0	0
Map 1-4	60 to 55	31	0	0
	55 to 50	11	0	0
	50 to 45	11	0	0
	45 to 42.9	4	0	0
Mississippi River, IL-MO	42.9 to 40	16	0	0
Map 1-3	40 to 35	28	0	0
	35 to 30	22	0	0
	30 to 26	15	0	0
Mississippi River, IL-MO	26 to 25	5	0	0
Map 1-2	25 to 20	24	0	0
	20 to 15	17	0	0
	15 to 10	22	0	0
	10 to 5	24	0	0
	5 to 0	8	0	0
Totals		883	0	0

Total, St. Louis District: 883 dikes

Note: An undetermined number of dikes will be built between 1988 and 2010 to complete the Master Plan for the Mississippi River within the St. Louis District.

Table 11

St. Paul District, North Central Division

Based on 1984 Project Maps

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Mississippi River, MN-WI Lock and Dam No. 3 Area Map 20	778 to 796	9	0	0
Mississippi River, MN-WI Lock and Dam No. 4 Area Map 22	753 to 751	11	0	0
Mississippi River, MN-WI Lock and Dam No. 5 Area Map 24	738	6	0	0
Mississippi River, MN-WI Lock and Dam No. 5-A Area Map 26	729 to 728	5	0	0
Mississippi River, MN-WI Lock and Dam No. 6 Area Map 28	716 to 713	25	0	0
Mississippi River, MN-WI Lock and Dam No. 7 Area Map 30	704 to 702	16	0	0
Mississippi River, MN-WI Lock and Dam No. 8 Area Map 32	681 to 679	8	0	0
Mississippi River, MN-WI Map 36	616 to 614	8	0	0
Mississippi River, MN-WI Map 48	728 to 723.9	28	0	0
Totals		116	0	0

Total, St. Paul District: 116 dikes

Table 12

Tulsa District, Southwestern Division

Based on 1980 Project Maps

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Arkansas River, AR	336 to 330	29	0	0
Map 1	330 to 320	42	0	5
	320 to 310	7	0	24
	310 to 305	3	0	4
Totals		81	0	33

Total, Tulsa District: 114 dikes

Table 13

Vicksburg District, Lower Mississippi Valley Division

Based on 1985 Project Maps

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Mississippi River, AR, MS, LA* Map 1-3-2	620 to 600	1	0	7
	600 to 580	16	0	2
	580 to 560	8	0	0
	560 to 540	23	1	3
	540 to 520	19	2	4
	520 to 500	16	0	0
	500 to 480	19	0	4
	480 to 460	5	0	0
	460 to 440	7	0	0
	440 to 420	2	0	4
	420 to 400	7	0	0
	400 to 380	8	0	0
	380 to 360	0	2	3
	360 to 340	8	0	0
	340 to 320	2	0	0
Lower Arkansas River, AR Map 1-5	Hopedale Cutoff	0	6	0
	Morgan Bend	5	0	0
	Fletcher Bend	0	3	0
Red River, LA** Below Dension Dam Map 5-16	372.7-Garland City	10	4	3
	370.5-below Garland City	0	3	0
	312-Twelve Mile Bayou Bend	0	1	0
	303.8-Uni, LA	0	5	0
	309-Honore Bend	0	5	0
	268.4-Curtis	0	1	0
	266-Lucas Bend	0	3	0
	262.3-Vernon-Mayer Bend	0	9	0
	259.8-Cupples Landing	3	0	0
	241.9-Williams	6	0	0
	225-Gahagan Bend	0	3	0
	215.2-Hanna	0	6	0
	187.0	1	0	0
	161.0	1	0	0

(Continued)

Note: One hundred and eight dikes are scheduled to be built between 1988 and 2010 to complete the Master Plan for the Mississippi River within the Vicksburg District.

* Data compiled from Project Maps and the "Mississippi River Channel Improvement Data Report" FY-1988.

** Data compiled from Project Maps and the "Red River Channel Improvement Data Report" FY-1988.

Table 13 (Continued)

Vicksburg District

River and Location	River Miles	Type of Dike		
		Stone	Pile	Stone-Filled Pile
Red River, LA**	145.0	1	0	0
Below Dension	140.6-Colfax	0	6	0
Dam	138-McNeely	1	0	0
Map 5-16	136-Raven Camp	1	0	1
(Continued)	126 Pointfield	1	0	0
Lower Red River, LA**	121.6-Bertrand	0	10	0
	118.0-Marteau	1	0	0
	111.0-England	1	0	0
	101.9-Maria	0	0	1
	89.5-Whittington	3	0	0
	87.0-Hog Lake	14	0	0
	84.0-Wilson Point	1	0	0
	79.0-Richardson	0	6	0
	77.9-Echo	0	3	0
	76.6-Cologne	0	3	0
	76.0	1	0	0
	71.2-Choctaw Bayou Bend	0	3	0
	62.0-Barbin	1	0	0
	59.0-Hadden-Ft. Derussy	3	0	2
Red River, LA** Below Dension Dam Map 5-22	55.7-Saline and Double Eddy	0	1	0
Lower Red River, LA**	50.5-Lock and Dam 1	4	0	0
	41.0-Larto ACS	13	0	0
	37.5-Joffrion	6	0	0
	36.0-Lorran Lake	0	0	5
	34.1-Delhoste	1	0	0
	26.4	4	0	0
	21.8-Bayou Cocodrie	11	0	0
Red River, LA** Map 5-5 Sheet 2 of 7	381	1 closure structure		
	350	1 closure structure		
	306	1 closure structure		
	262	1 closure structure		
	226	1 closure structure		
	222	1 closure structure		
	203	1 closure structure		

(Continued)

** Data compiled from Project Maps and the "Red River Channel Improvement Data Report" FY 1988.

Table 13 (Continued)

Vicksburg District

River and Location	River Miles	Type of Dike
Red River, LA**	197	1 closure structure
Map 5-5	194	1 closure structure
Sheet 2 of 7	191	1 closure structure
(Continued)	183	1 closure structure
	173	1 closure structure
	158	1 closure structure
	133	1 closure structure
	130-Pointfield	1 closure structure
	124-Darrow	1 closure structure
	121-Meade	1 closure structure
	109-Philip Bayou	1 closure structure
	104	1 closure structure
	101	1 closure structure
	97-Grand Bend	1 closure structure
	94	1 closure structure
	88	1 closure structure
	82-Once More	1 closure structure
	79-Bijou	1 closure structure
	71.9	1 closure structure
	60	1 closure structure
	49	1 closure structure
	43	1 closure structure
	37	1 closure structure
Twelve Mile Bayou	220	1 closure structure
Map 5-5		
Sheet 2 of 7		
Lower Arkansas River, AR	74-Boyd Pt. Cutoff	
Map 1-5		1 closure structure
White River, AR	4	1 closure structure
Map 1-5		
Ouachita River, LA	132	1 closure structure
Map 2-3		
Black River, LA	25	1 closure structure
Map 2-3		
Yazoo River, MS	105	1 control weir
Map 2-15		

(Continued)

** Data compiled from Project Maps and the "Red River Channel Improvement Data Report" FY 1988.

Table 13 (Concluded)

Vicksburg District

River and Location	River Miles		Type of Dike
Pearl River Lateral Canal, MS-LA Maps 4-4 and 4-8	48.7-Pools Bluff		1 sill
	44		1 sill
Totals	Stone dikes	235	
	Pile dikes	86	
	Stone-Filled Pile Dikes	39	
	Closure Structures	35	
	Sills	2	
	Control Weir	1	

Total, Vicksburg District: 398 structures

Table 14

Total Number of Dikes by District

District	No. of Dikes
Kansas City	3,560
Little Rock	1,018
Memphis	273
Mobile	153
Omaha	2,833
Portland	3
Rock Island	1,048
Savannah	253
St. Louis	883
St. Paul	116
Tulsa	114
Vicksburg	398*
Total	10,652

Note: Districts without dikes are listed in Table 1.
* Includes 35 closure structures, 1 control weir, and 2 sills.